REMARKS/ARGUMENTS

Claim 1-16 are pending in the application.

Claim 1-16 stand rejected in the Examiner's Action dated June 30, 2008 (hereinafter "the Examiner's Action". The examiner states claims 1-16 are rejected under 35 USC 103(a) as being unpatentable over Kuroyanagi et al, US Patent No. 4,782246 (hereinafter "Kuroyanagi") in view of Herring, US Patent Publication 2002/0001317 A1 (hereinafter "Herring").

The Examiner states, regarding claim 1, that Kuroyanagi discloses an inexpensive and programmable amplitude and phase shifting circuit comprising: an enclosure comprising: a plurality of signal sending digital control lines routed to an amplitude/phase shifting circuit board; and means for selecting a single amplifier for operator selected amplitude or phase signal gain change; an amplitude/phase shifting circuit board comprising: a plurality of programmable gain operational amplifiers, one amplifier selected at a time to have its gain changed when an operator desires a new amplitude or phase each of said digital control lines connected to a different multiplying operational amplifier chip select line on said amplitude/phase shifting circuit board; and means for controlling said amplitude/phase shifting circuit; but fails to disclose means for holding printing circuit boards and a front panel for receiving input and output signals; a motherboard comprising: means for supplying input signals through said front panel; a power source for supplying input signals through said front panel; a power source; digital control lines; and a demultiplexer circuit board; said demultiplexer circuit board within said motherboard comprising: a plurality of signal receiving digital control lines from a digital output card in a personal computer; and a plurality of signal receiving digital control lines for receiving output lines from said demultiplexer.

The Examiner states that taking the combined teachings of Kuroyanagi and Herring as a whole, one skilled in the art would have found it obvious to modify the inexpensive and programmable amplitude and phase shifting circuit comprising: an enclosure comprising: a plurality of signal sending digital control lines routed to an amplitude/phase shifting circuit board; and means for selecting a single amplifier for operator selected amplitude or phase gain change; an amplitude/phase shifting circuit board comprising: a plurality of programmable gain operational amplifiers, one amplifier selected at a time to have its gain changed when an

operator desires a new amplitude or phase; each of said digital control lines connected to a different multiplying operational amplifier chip select line on said amplitude/phase shifting circuit board; and means for controlling said amplitude/phase shifting circuit with disclose means for holding printing circuit boards and a front panel for receiving input and output signals; a motherboard comprising: means for supplying input signals through said front panel; a power source; digital control lines; a demultiplexer circuit board; said demultiplexer circuit board within said motherboard comprising: a plurality of signal receiving digital control lines from a digital output card in a personal computer; and a plurality of signal receiving digital control lines for receiving output lines from said demultiplexer in order to be able to detect the phase difference between input and output signals within a computer device.

In response herein, Applicants acknowledge the Examiner's view of Kuroyanagi's invention as an inexpensive analog electrical circuit for phase shifting electrical signals. However, in Applicants' invention, the phase shift is independent of the frequency of the signal where Kuroyanagi's is not and this is a critical difference. The phase shift given by Kuroyanagi's invention can be found from his equation (5) and (7) as

$$\theta = \operatorname{atan}\left(\frac{2\omega CkTqI_0}{(\omega CkT)^2 - (qI_0)^2}\right)$$

where θ is the phase shift, atan is the inverse tangent, ω is the input and output signal's frequency, C is a capacitance value for a capacitor in the circuit, k is the Boltzmann constant, T is the absolute temperature at the junction of the transistor, q is the charge of an electron, and I_0 is the current value of the variable current source that is used to control the amount of phase shift. The fact that Kuroyanagi's phase shift is a function of frequency is demonstrated by the presence of ω in the equation. Therefore, if I_0 is set such that the desired phase shift is produced at one frequency, when the frequency of the input signal changes to a different frequency, an incorrect and undesired phase shift will be produced. If the phase shift is required to remain constant as frequency is changed (as in our application), then Kuroyanagi's invention would have to change the value of I_0 to give the desired phase shift each time the frequency changes.

In contrast, in our invention the phase shift can be found from our equation (2) as

$$\theta = \text{asin}\left(\frac{B}{A}\right)$$

where A and B are constants. Clearly, the phase shift is independent of frequency. This is what allowed us to sweep the excitation to our structure over a range of frequencies while maintaining the desired phase shift between channels. This was done by sweeping the sine and cosine inputs across frequencies, resulting in all the phase shifted outputs of the device also sweeping over the same range of frequencies. This is what allows us to characterize the frequency response of a structure over a range of frequencies to phase synchronized excitation in one test.

Applicants respectfully submit that one skilled in the art would look away from Kuroyanagi's patent for use in Applicants' vibration testing application because it would result in a very cumbersome and time consuming test process because Applicants' goal is to characterize the frequency response of a structure over thousands of frequencies, and each time the frequency (and I_0) is changed, a wait time on the order of tens of seconds is required for the change induced transient vibrations to die out and steady state vibration at the new frequency to be achieved. Kuroyanagi's invention is unacceptable for Applicants' purposes, because the phase shift is not frequency independent and we desire to characterize the response of a structure to phase synchronized excitation over a range of frequencies. With regards to Herring, Applicants' submit that the Examiner's reliance is misplaced in that there are no similarities to Applicants' invention. Applicants' invention deals with phase shifting analog signals whereas Herrings' patent deals with digital signals and is not relevant to Applicants' invention at all. Therefore, Applicants respectfully submit that it would not have been obvious for one skilled in the art to combine Kuroyanagi and Herring to come up with the amplitude and phase shifting circuit of Applicants' invention.

To place the claims in better form for allowance and to highlight the significant aspect of Applicants' invention detailed above, Applicants have amended claims 1 and 9 to add the feature of operating independent of frequency as detailed above, and along with the remarks of argument and explanation, thereby overcome the Examiner's rejection to claims 1 and 9.

Dependent claims 3, 5, 6, 7 and 11,12, 15 and 16 are similarly amended to conform to the newly amended claim 1 and 9 on which they depend, respectively. The issue of new matter is avoided in as much as the amended language conforms to the originally filed specification at page 2, paragraph 0002 and page 3 at paragraph 0007.

Regarding claim 2, wherein said enclosure further comprises a front panel for receiving sine and cosine input signals and phase shifted output signals." Kuroyanagi and Herring fail to disclose sine and cosine being generated as claimed. The examiner states official notice is taken that both the concepts and advantages of generating sine and cosine signals are well known in the art and it would have been obvious to use sine and cosine signals since sine and cosine are merely functions of signals. In response herein, Applicants cancel claim 2.

Regarding claim 3, the combined teachings of Kuroyanagi and Herring disclose the amplitude and phase shifting circuit of claim 1 wherein said enclosure mounts onto a standard electronics rack. In response herein, Applicants submit that inasmuch as the Examiner's rejection of claim 1 is overcome, on which claim 3 relies, the Examiner's rejection of claim 3 is similarly overcome.

Regarding claim 4, the Examiner states Kuroyanagi and Herring fail to disclose a 50-pin ribbon cable as claimed, but that official notice is taken that both the concepts and advantages of providing a 50-pin ribbon cable are well known in the art and it would have been obvious to use a 50-pin ribbon cable since they are commonly used as input output adapters. In response herein, Applicants cancel claim 4.

Regarding claim 5, the Examiner states the combined teachings of Kuroyanagi and Herring disclose the amplitude and phase shifting circuit claim 1 wherein said means for controlling said amplitude/phase shifting circuit comprises a digital output card from a personal computer. In response herein, Applicants submit that inasmuch as the Examiner's rejection of claim 1 is overcome, on which claim 5 relies, the Examiner's rejection of claim 5 is similarly overcome.

Regarding claim 6, the Examiner states it has been analyzed and rejected in accordance with claim 4. In response herein, Applicants cancel claim 6, thereby overcoming the Examiner's rejection.

Regarding claim 7, the Examiner states the combined teachings of Kuroyanagi and Herring disclose the amplitude and phase shifting circuit of claim 5 wherein an operator interfaces with said digital output card through software In response herein, Applicants submit that inasmuch as the Examiner's rejection of claim 1 is overcome, on which claim 5 relies and on which 7 relies, the Examiner's rejection of claim 7 is similarly overcome.

Regarding claim 8, the Examiner states Kuroyanagi and Herring fail to disclose the use of LabVIEW software to output the digital signals, but that official notice is taken that both the concepts and advantages of using LabVIEW to output digital signals are well known in the art and that it would have been obvious to use LabVIEW since it is commonly used for data acquisition. In response herein, Applicants' cancel claim 8, thereby overcoming the Examiner's rejection.

Regarding claim 9, see above.

The Examiner states claims 10 and 15 have been analyzed and rejected in accordance with claims 2 and 9. In response herein, Applicants cancel claim 10, thereby overcoming the Examiner's rejection. Regarding claim 15, Applicants add the language "over a single frequency or sweep in frequency" to the claim to highlight a significant aspect of the invention and distinguishing Applicants' invention from that of Kuroyanagi and Herring, thereby overcoming the Examiner's rejection.

The Examiner states claims 11 and 12 have been analyzed and rejected in accordance with claims 5 and 9. In response herein, Applicants submit that that inasmuch as the Examiner's rejection of claims 5 and 9 are overcome by amendments to the claims and remarks of argument and explanation, on which claims 11 and 15 rely, the Examiner's rejection of claims 11 and 12 are similarly overcome.

The Examiner states claim 13 has been analyzed and rejected according to claims 8 and 9.

In response herein, Applicants cancel claim 13, thereby overcoming the Examiner's rejection.

The Examiner states claims 14 has been analyzed and rejected according to claims 4 and 9. In response herein, Applicants cancel claim 14, thereby overcoming the Examiner's rejection.

Regarding claim 16, the Examiner states the combined teachings of Kuroyanagi and Herring disclose the inexpensive, programmable, multiple channel amplitude and phase shifting method of claim 9 wherein said selecting step further comprises the steps of: determining timing and sequence of reading data lines from said motherboard; storing data in a buffer; and changing gain of a selected operational amplifier. In response herein, Applicants submit that that inasmuch as the Examiner's rejection of claim 9 is overcome by amendments to the claims and remarks of argument and explanation, on which claim 16 relies, the Examiner's rejection of claim 16 is similarly overcome.

Consideration of the amendments and allowance of the application are respectfully solicited.

Respectfully submitted,

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